Abstract

Sleep apnea is a sleep disorder that causes repeatedly reduced respiration or no airflow in a period of time during sleep. Sleep apnea can be detected by analyzing bio-physiological signals such as electrocardiogram, oxygen saturation and respiratory effort, etc. The changes of bio-physiological signals, that are recorded during sleep, are usually kept in files which have low level abstractions, indexing primitives, and diverse formats such as EDF/EDF+ file formats[cite], or a Waveform Database format[cite] (PhysioBank databases). For managing and querying data from these files are required to use the provided software packages, i.e. the WFDB software package[cite] for the Waveform Database format, or to write a new software application based on the specification of the file formats, which lead to the widely difficulty of programming and analyzing bio-physiological data.

This thesis presents a relational database model for storing not only Obstructive Sleep Apnea signals, but also other bio-physiological signals. The first benefit of using a relational database for storing bio-physiological data is no need to write or include management tools for managing the collected data. Furthermore, data analysis can be directly performed on the collector devices (mobile devices) by using SQL language, which provides many useful algorithms for analyzing data. In addition, remote services can ask for some parts of data from collector devices by using remote querying. For example, while a patient records samples during sleep, a doctor can get data from electrocardiogram by simply sending a simple SQL query to the device used by the patient. Last but not least, the privacy of patients is not violated if they can keep their bio-physiology on their own devices, and can decide which data they would like to send.

The database model that is presented is this thesis is a platform independent, it can therefore be implemented on whatever database management system as long as they support SQL language. In this thesis, a design and implementation of a database application for the database model are proposed. The design is discussed at an abstract level, and is a platform independent, in which it describes the ways the database application works with real-time sources and files. Android platform is chosen as an implemented platform for both the database model and database application. Data sources for the database are from CESAR acquisition tool and EDF files that are exported from PhysioBank.

The database size is less than XXMB after collecting data from all channels of CESAR acquisition tool with 100Hz for each channel. That is, the application can collect data for a whole day without any storage problem. The power consumption for the application is XX% of the total power drain on the device, which is quiet efficient. The average read time and write time are XX millisecond and XX millisecond for 10000 samples. With a stress test, the application shows that it can manage up to XX channels with XXHz while importing XX files, exporting XX files, and visualizing incoming samples on a graphic view.

Nevertheless, the results show that the database model and database application are very efficient for storing and analyzing Obstructive Sleep Apnea signals, and other bio-physiological signals.